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AUTHOR Ciampa, Bartholomew J.
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ABSTRACT

In establishing performance-based programs, mathematics teachers should understand how behavioral objectives are constructed, applied, analyzed, and evaluated. To construct behavioral objectives, the following factors should be considered: (a) outcome; (b) level of achievement, and (c) evaluation conditions. When behavioral objectives are applied at the organizational level, they can be used to predict the accomplishments of a large instructional division. Behavioral objectives at the program level can predict the outcomes of specific mathematics programs within curricular parameters. At the learner or classroom level, objectives usually represent small accomplishments within long-term unit or course goals. The more precise the behavioral objective, the easier it is to evaluate. Once evaluated, the objective should be modified and restated, if needed, to ensure maximum validity in its reflection of competence attainment. (Author/JC)

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Behavioral Objectives

for

Mathematics Teachers

by

Dr. Bartholomew J. Ciampa
Director of Teacher Training and
Associate Professor of Education
Nasson College, Springvale, Maine

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The competency-based (or performance-based) movement, so much in evidence today, is rapidly sweeping through the field of education because of the promise it holds for revitalizing the foundations upon which our systems of education are based. In competency-based programs, performance goals are delineated and agreed upon before the actual instruction begins.

The teacher is expected to promote desireable learning through his teaching behavior, and, concommitantly, the student is responsible for attaining a given level of competency as demonstrated by the quality of his work production.

Mathematics teachers (all teachers, in fact) who wish to initiate performance-based programs should begin by asking three questions: 1) How are behavioral objectives constructed? ; 2) Once constructed, how are they applied?; 3) How are they analyzed and evaluated?

A behavioral objective, the reader will remember, is an observable criterion of performance. It is a clear, precise statement of the student's behavior that will be accepted as evidence of his having achieved what he and his teacher have set out to accomplish. It can be a long-term goal which indicates a sequence of tasks the student can be expected to perform. It can be short-term in the sense of merely being a response the student is expected to make. It can also be a simple or complex skill which can be demonstrated after certain learning experiences are undertaken.

Construction of Objectives

When behavioral objectives are constructed these factors should be considered: a) the outcome, or, what is to be achieved: b) the level of achievement, or, how well it is to be achieved; and c) the conditions of evaluation, or, under what circumstances it is to be achieved.

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Outcomes, more specifically, are simple words or phrases which clearly state the ultimate tangible benefit of some activity. They usually contain the verbs or "action words" of the objective. Words like "count, designate, diagram, inscribe, and integrate," may serve as examples.

Levels of achievement are phrases which specify the standards or criteria against which the outcome will be measured. Examples of such phrases might be: ". . . at least n% correct. . .", or, "...accurate to n decimal places..."; or, "...meeting attainment levels as cited in ___."

Conditions of evaluation are simply phrases which describe the conditions which are to be held constant while in the process of determining whether the objective has (or hasn't) been achieved. This portion of the objective may also include materials which should be available, time allocations, whether the performance should be written, oral, or demonstrated experimentally, etc.

Examples of completed behavioral objectives might be: " Individual students will be able to construct, within a five-minute time period, an isosceles right triangle using only pencil, paper, compass, and straightedge," or, "Each student will represent the quotients of the specified problems accurate to three decimal places with 90% correct before advancing to the next module."

Application of Objectives

Behavioral objectives can be applied to each of the three dimensions of most mathematics programs: a) the organizational level; b) the program level; and c) the learner or classroom level.

Organizational objectives can be used to predict the accomplishments of a large operating division of instruction. These objectives can be used to set expectancy levels in such areas as cost effectiveness evaluation, staff analysis, personnel development, etc.

Program objectives are usually stated in broad terms and predict the outcomes of specific math programs within curricular parameters.

They deal with large numbers of learners and can be used to synthesize the organizational and the learner objectives.

Learner objectives are usually represented as small, measureable, and atomized accomplishments which are framed within the teacher's long-term unit or course goals. These are the objectives with which the great majority of mathematics teachers should be concerned. They should be explicitly stated as opposed to the intuitive approach which one often hears; i.e. "I've been doing that for years. I just haven't been writing the objectives down."

Evaluation of Objectives

Obviously, the more precise the behavioral objective, the easier it is to evaluate. Once evaluated, the objective should be modified and re-stated, if needed, to ensure maximum validity in its reflection of competence attainment. Questions of appropriate complexity, usefullness, abstractness, timing, etc., should be considered again at this time.

Conclusion

Within the framework of our modern "systems" approach it is necessary to define the precise nature of the goal which is hoped to be achieved as the first priority. Behavioral objectives make it possible for students and

teachers to function at the highest possible level of competency within specified curricular areas. However, this endeavor should not displace the humanistic responsibility of the teacher.

Within the classroom context, through the effective application of behavioral objectives the teacher should be constantly aware of his responsibility and his accountability for the development of his students as competent mathematicians and responsible citizens.

Behavioral objectives can facilitate charting the course toward meeting these ends.

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Insert A: Examples of Verbs for Objectives

add	compile	divide	interpolate	reduce
allocate	compound	estimate	label	select
analyse	compute	evaluate	measure	solve
bisect	construct	expand	multiply	sort
calculate	convert	extrapolate	number	square
catagorize	count	extract	order	subtract
chart	decrease	formulate	plot	tabulate
check	derive	graph	prove	tally
combine	differentiate	group	recall	transpose
compare	distribute	integrate	record	verify

Insert B : Examples of Levels of Achievement

... accurate to three decimal places
... meeting standards as cited in ___.
... with increased accuracy over n trials.
...at least n consecutive correct responses.
...at least x out of y correct.
...at least n% correct.
...as judged by a panel of experts.
...to the satisfaction of the teacher.
...surpassing norm established by ___.
...surpass national average.